

# HANDS ON WORKSHOP

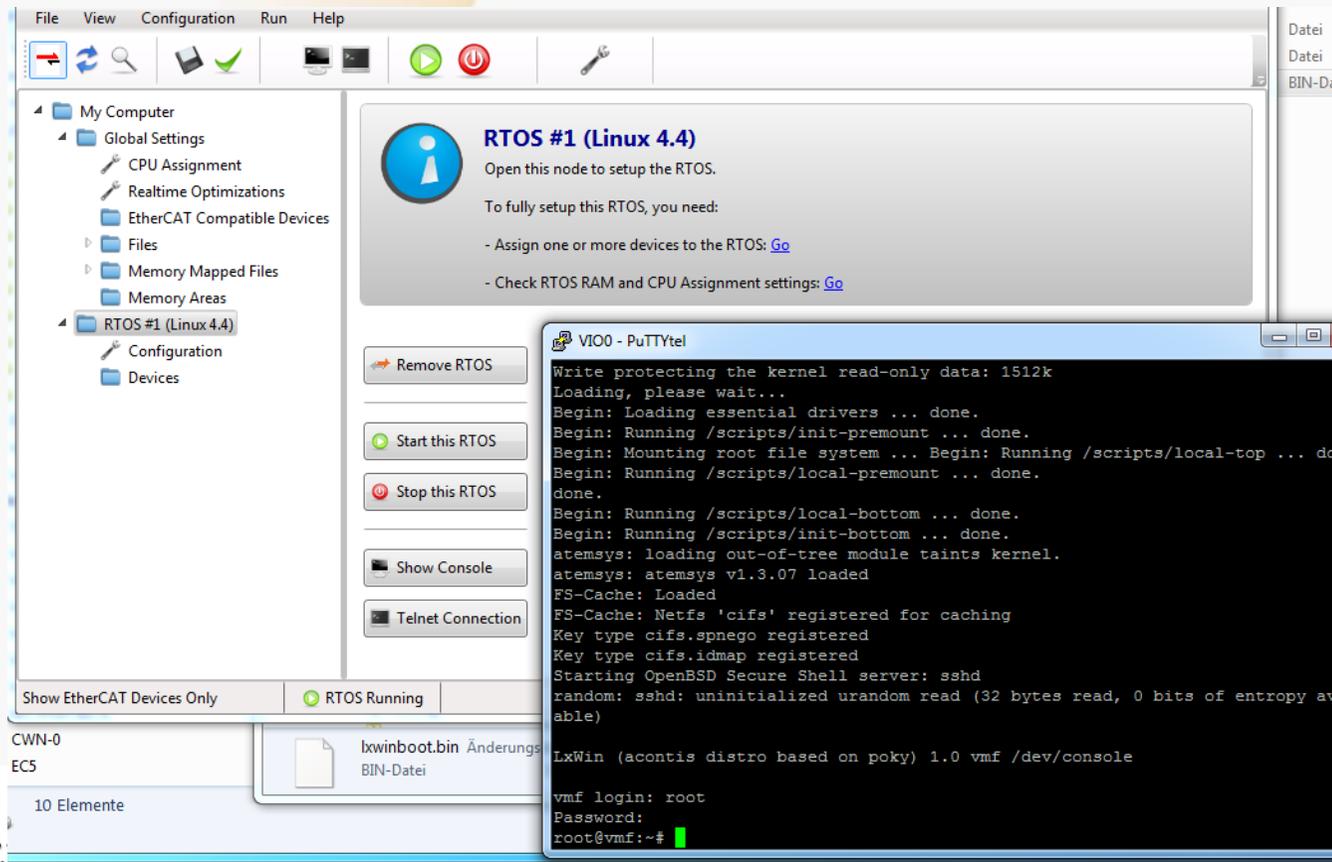
# Setup

- Hardware requirements
  - PC with Windows 10, 64 Bit
  - One Ethernet adapter to be used for TCP/IP (Windows)
  - One additional Intel or Realtek Gigabit Ethernet adapter to be used for EtherCAT
  - At least a Dual Core processor
  
- Install Visual Studio (2010 or later)
  
- Install VisualGDB (**after** Visual Studio installation!)
  - <http://visualgdb.com/download/>
  
- Install Filezilla
  - <https://filezilla-project.org/download.php>

- Install the LxWin Evaluation version
  - <http://software.acontis.com/RTOSWin71/7.1.00.01.LxWin.{6DDDD85E-9932-4127-B35A-10A6493A39C1}/LxWin.7.1.00.01.zip>
- Install the EC-Master package for LxWin
  - <http://software.acontis.com/EC-Master/3.1/Linux/EC-Master-V3.1.0.18-EC-WinRT-Linux-Eval.zip>
  - Unzip all files to C:\EC-Master-Linux

# First steps

- Open LxWin System Manager
- Follow the steps described in chapter 3.2 of the LxWin manual
  - Run the shipped Linux image
  - Login into the Linux OS



# Real-time analyzation and optimization

- Run the Realtime Analyzer

System Manager V4.1 Build 3 (64-Bit Edition) - [C:\Users\szf\AppData\Roaming\acontis technologies\workspaces\lxwin]

File View Configuration Run Help

My Computer

- Global Settings
  - CPU Assignment
  - Realtime Optimizations
- EtherCAT Compatible Devices
- Files
- Memory Mapped Files
- Memory Areas
- RTOS #1 (Linux 4.4)
  - Configuration
  - Realtime Analyze
- Devices
  - RTOS Ethernet Controller
- Applications

**Realtime Analyze**

Start/Stop

Results

Metric	Value
CPU Throttling... (Delta %)	0
Task Latency... (Min (us))	0
Task Latency... (Avg (us))	0
Task Latency... (Max (us))	19.82
System Mgmt Irq (SMI)... (Count)	0

**Yellow/Red Traffic Sign:**  
To assure deterministic real-time behavior several settings may have to be adjusted depending on the PC hardware in use.  
<http://www.acontis.com/eng/support/pc-hardware-real-time-optimization/index.php>  
PW: acontis2001

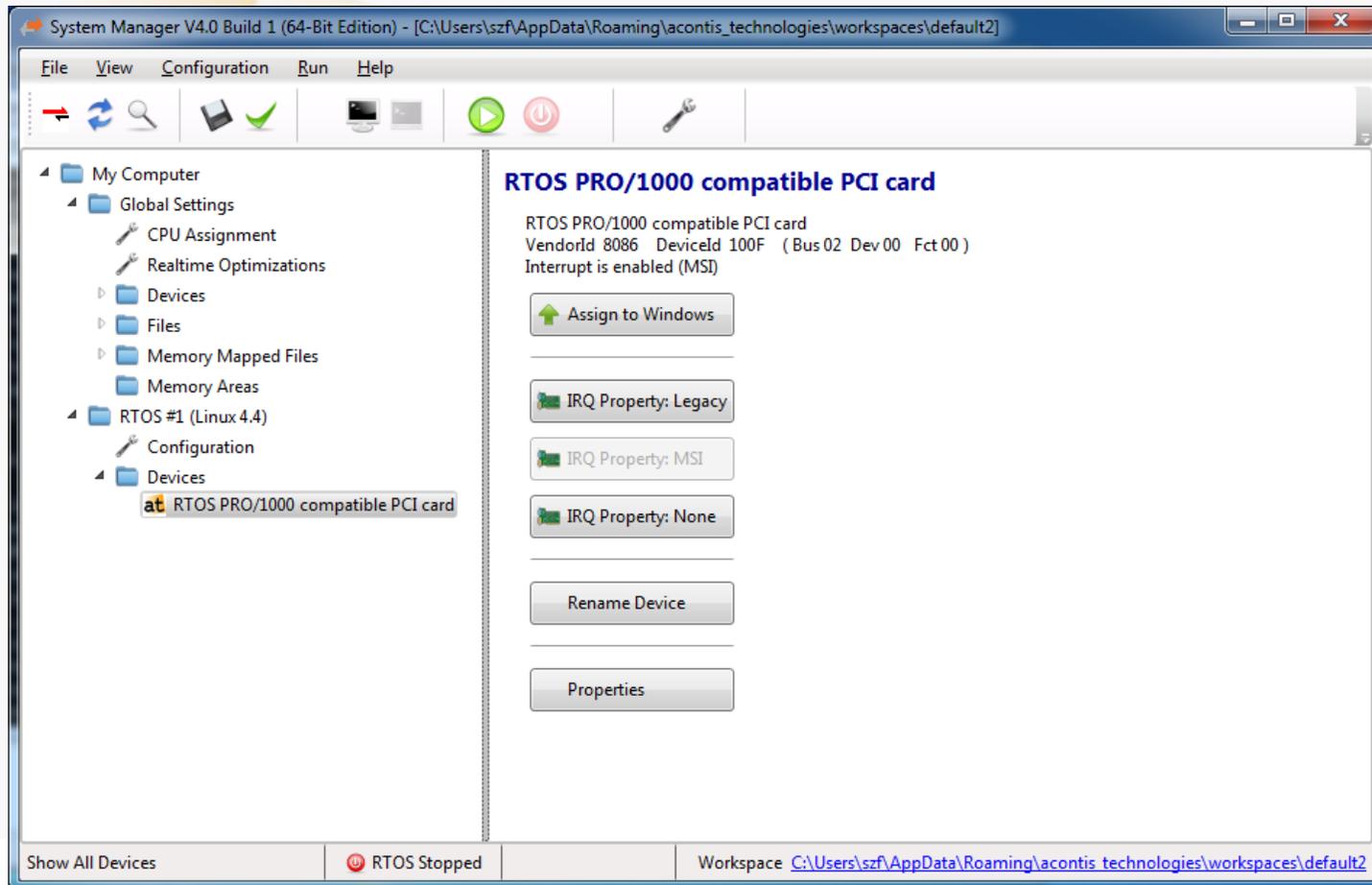
Show EtherCAT Devices Only | RTOS Stopped | Workspace: C:\Users\szf\AppData\Roaming\acontis technologies\workspaces\lxwin

- Possible required real-time optimizations
  - SMI Patch (VT will have to be enabled)
  - C1E Patch
  - BIOS Powermanagement settings
  - USB Legacy

- See chapter 3.7 in the manual
- Access the Windows hard disk via the LxWin file server
  - Files are located in the workspace: <workspace>\rtfiles directory
  - Network share mounted in Linux at /mnt/rtfiles
- Download files from Windows to Linux
  - Start FileZilla
  - Create new Site
    - Server: 192.168.157.2
    - Protocol: SFTP
    - Connection: Normal
    - User: root
    - Password: root

# Hardware Partitioning

- Add the Intel Ethernet adapter to Linux
  - See chapter 3.5 of the LxWin manual



- Visual Studio: Follow steps described in chapter 3.4 of the LxWin manual
  - Create a new project using Visual Studio
  - Build and Debug the application
  
- Eclipse: Follow steps described in chapter 3.3 of the LxWin manual
  - Create a new project using Eclipse
  - Build and Debug the application

# EC-Engineer and LxWin on the same PC

The image shows a Windows desktop environment with the EC-Engineer software running. The software interface includes a menu bar (File, View, Network, Settings, Help), a toolbar with buttons for Configuration Mode, Export ENI, Export EXI, and Diagnosis Mode, and a main workspace divided into Project Explorer and Device Editor. The Device Editor displays the EC-Engineer logo and options for adding master units (EtherCAT Master Unit Class A, Class B, and Simulator Unit) and recent projects.

Overlaid on the software is a terminal window titled "VIO0 - PuTTYtel" showing a series of shell prompts: `root@vmf: /mnt/rtfiles#`. Below the terminal, there are two diagrams illustrating configuration methods:

- Online Configuration:** A laptop is connected to a network of slave units via EtherCAT. Description: "Slaves connected to engineering system".
- Remote Configuration:** A laptop is connected to a master unit via TCP/IP, which is then connected to slave units via EtherCAT. Description: "Slaves connected to target system".

## Run the EC-Master demo application - 1

- Copy all files from C:\EC-Master-Linux\Bin\Linux\x86 into the rfiles folder in your workspace
- Assure the network adapter is assigned to Linux
- Connect some EtherCAT slaves to the Ethernet port
- Start LxWin and log in into the shell
- Change into the rfiles folder: `cd /mnt/rfiles`
- If you run the master stack with the Intel Gigabit network adapter:  
start the demo: `./EcMasterDemo -i8254x 1 1-sp 6000`
- If you run the master stack with the Realtek Gigabit network adapter:  
start the demo: `./EcMasterDemo -rt18169 1 1-sp 6000`

## Run the EC-Master demo application - 2

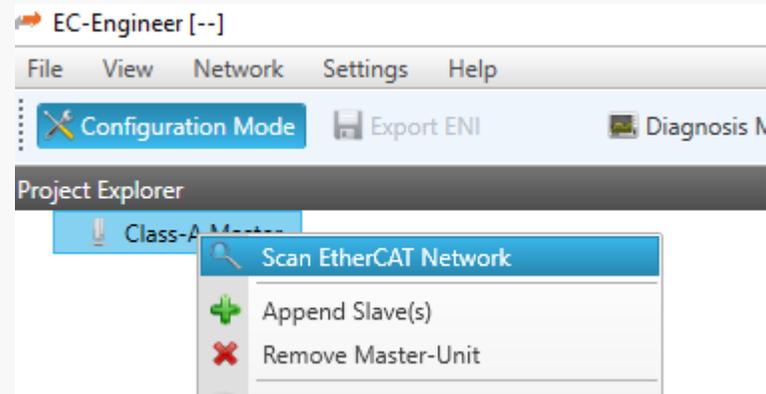
- If the master stack is up and running you can connect EC-Engineer running on Windows. For that purpose you need to select “Remote Configuration” in the main page, select Class A master and use the virtual network IP address: 192.168.157.2.

### Slaves connected to remote system

IP Address	192 . 168 . 157 . 2
Port	6000
Master-Instance	0 <span style="float: right;">Deselect</span>

- Finally you should be able to connect to the master stack running within LxWin.

- Right click the Class-A Master in the left pane of EC-Engineer and select “Scan EtherCAT Network”



- After successfully scanning the network, please select “Export ENI”
- Store the ENI file into the rfiles folder of your workspace, use the name eni.xml

- Restart LxWin and log in again or stop the EtherCAT demo application using CTRL-C command
- Change into the rfiles folder: `cd /mnt/rfiles`
- If you run the master stack with the Intel Gigabit network adapter:  
start the demo:  
`./EcMasterDemo -f /mnt/rfiles/eni.xml -i8254x 1 1-sp 6000`
- If you run the master stack with the Realtek Gigabit network adapter:  
start the demo:  
`./EcMasterDemo -f /mnt/rfiles/eni.xml -rtl8169 1 1-sp 6000`
- Reconnect EC-Engineer again and change into “Diagnosis Mode”

- Create a new workspace
- Use the settings described in chapter 3.4.2 of the LxWin Manual
- To execute the demo from within Visual Studio, the following steps have to be executed
  - Copy the ENI file (eni.xml) into the appropriate location (e.g. into the rfiles folder in your workspace). In that case, the command line parameter for finding the ENI file is “-f /mnt/rfiles/eni.xml”
  - Set the appropriate command line arguments in the “Debug settings” dialog of VisualGDB. Note: if you run the master stack with Intel Gigabit network adapter, the arguments for the demo application are “-i8254x 1 1”. For Realtek Gigabit network adapter they are “-rtl8169 1 1”
  - Example: “-f /mnt/rfiles/eni.xml -i8254x 1 1 -perf -sp 6000”
- If the master stack is up and running you can connect EC-Engineer running on Windows. For that purpose you need to select the remote connection using the virtual network (IP address defaults to 192.168.157.2).